19

CLAIMS

1.   A method of determining the condition of a device, process, material or structure including the steps of measuring acoustic emissions from the device or process, determining inter-arrival times of acoustic emission events; determining a statistical distribution of the inter-arrival times and therefrom statistical parameters characterising the distribution, using the statistical parameters as an indication of the condition of the device or process being monitored.

2.   A method according to claim 1, wherein the statistical parameters are obtained using parameter estimation.

3.   A method according to claim 1 or 2, wherein a Weibull distribution is used.

4.   A method according to claim 1, 2 or 3, including the step of determining a shape to characteristic life distribution for at least one component of the device or process.

5.   A method according to claim 4, wherein the shape to characteristic life parameter is a unit based on inter-arrival times of successive acoustic emission events and is a function of the ratio of the shape factor of the inter-arrival time distribution to the characteristic and guaranteed life in a statistical distribution used to describe the probability of time to failure.

6.   A method according to any preceding claim, including the step of monitoring trends in changes in the determined parameters over time.

7.   Apparatus for determining the condition of a device, process, material or structure, including at least one sensor operable to measure acoustic emissions from a device or process to be monitored; processing means operable to determine inter-arrival times of acoustic emission events, to determine a statistical distribution of the inter-arrival times and therefrom statistical parameters characterising the distribution and to use the

statistical parameters as an indication of the condition of the device or process being monitored; and output means to output the results of the determination to a user.

8.   Apparatus according to claim 7, wherein the processing means is operable to obtain the statistical parameters using parameter estimation.

9.   Apparatus according to claim 7 or 8, wherein the processing means is operable to use a Weibull distribution.

10.   Apparatus according to claim 7, 8 or 9, wherein the processing means is operable to determine a shape to characteristic life distribution for at least one component of the device or process.

11.   Apparatus according to claim 10, wherein the shape to characteristic life parameter is a unit based on inter-arrival times of successive acoustic emission events and is a function of the ratio of the shape factor of the inter-arrival time distribution to the characteristic and guaranteed life in a statistical distribution used to describe the probability of time to failure.

12.   Apparatus according to any one of claims 7 to 11, wherein the processing means is operable to monitor trends in changes in the determined parameters over time.

13.   Apparatus according to any one of claims 7 to 12, wherein the output means includes a graphical display, an optical display and/or an acoustic signal.

14.   Apparatus according to claim 13, wherein the output means provides an alarm signal operable to activate an alarm, including to an acoustic alert device, a telephone, to an electronic mail address.